tell us where the mass is and how to remove it. It tells us whether there is underlying brain injury and it tells us whether to open the dura [the membrane covering the brain] and where in the brain to go to remove the clot."

Not unexpectedly, however, doctors sometimes use CT scans on occasions when it is unlikely that the scans will provide any useful information. Although the scanners have narrowly focused x-ray beams with little scatter, they do nonetheless use several x-ray beams for each scan. As David G. Brown of the Bureau of Radiological Health of the Food and Drug Administration said at the conference, "A CT scan of the brain is not a low-dose procedure." The average dose from a CT brain scan is 1 to 10 rads, which is comparable to five or six conventional skull x-rays.

The consensus panel concluded that CT scans are not indicated for adults who have minor head trauma, simple or periodically occurring headaches, or dizziness with no other signs or symptoms. Because CT scans cannot show metabolic abnormalities in the brain but only show structural abnormalities and lesions, they are unlikely to be of much use in these cases.

The panel was particularly concerned about the possible overuse of CT scans in children, cautioning that "the effects of repeated cumulative low-level radiation doses to the immature developing brain (particularly from birth to 2 years of age) are unknown." CT scans are indicated for children with conditions such as severe head trauma, coma, and abnormally large heads, but they probably should not be used to evaluate children with developmental retardation, cerebral palsy, seizures, or headaches, the panel advised.

Although CT scans are expensive, costing an average of $180 to $300 per scan, and although the scanners themselves cost from $100,000 to $1 million, the conference participants argued that the advent of CT scans has actually decreased medical costs. The scans substitute for more complicated and lengthy procedures, many of which require hospitalization.

For example, David Norman of the University of California at San Francisco says that in his hospital, CT scans replaced procedures costing $2000 to $3000 for the diagnosis of pituitary tumors. Physicians used to request a series of skull x-rays, an angiogram, radionuclide studies, and a pneumoencephalogram to diagnose a tumor. Now they just do a CT scan, and the average presurgery hospital stay decreased from 5.7 to 1.5 days for patients with these tumors.

Because CT scanners save money and are, as David O. Davis of George Washington University in Washington, D.C., said, "the most effective tool in neurology," the conference participants spoke bitterly of regulations that limit their availability. Public hospitals and medical schools must file certificates of need with state planning boards before they can have permission to buy scanners. The legal costs for obtaining these certificates of need can be as much as $100,000 and there is no guarantee that these requests for scanners will be granted. As Alan Cormack of Tufts University, who won a Nobel Prize for his role in originating CT scans, said, "For $100,000 you can buy a good head scanner." In contrast, neurologists and private hospitals can and often do buy as many scanners as they want. Fred Plum, of Cornell University Medical College, who was chairman of the panel, said that in Connecticut the state planning board initially allowed only two scanners for this state with 3½ million people. He remarked, "Certificates of need have sharply reduced the capacity of large hospitals to add scanners but have placed no restrictions on the private sector. The result is that those most often subjected to trauma tend to have the least availability of the scanners."

—GINA KOLATA

Cleaning Up the Clean Air Act

A Brookings paper finds that good luck, not good regulation, reduced pollution in the 1970's

Contrary to popular myth, enforcement of the Clean Air Act has not been responsible for the general improvement in air quality since the 1960's, according to a new report issued by the Brookings Institution.* Most of the improvement in the last decade may be attributable to the "good luck" of a limping economy and the continuing substitution of clean fuels (oil and natural gas) for coal. That is the conclusion of Brookings economist Lester Lave and science fellow Gilbert Omenn, who was an Office of Management and Budget official in the Carter Administration. This finding is vigorously challenged by environmentalists.

The authors of the paper agree that controls imposed by the Environmental Protection Agency (EPA) have reduced emissions from new plants and new automobiles. But they claim that "the application of pollution controls to existing plants and older cars has been limited, and costs have been excessive, largely because Congress has failed to confront the difficult issues" of how to attack problems that predated the legislation. Lave and Omenn conclude that "a major revision of pollution abatement policy is required" and argue that if the government fails to undertake a radical revision of the Clean Air Act, it will be unprepared for the problems of the 1980's and 1990's. They write, "As the economy expands and national energy policy forces a return to coal, air pollution could get markedly worse."

The authorization for the Clean Air Act of 1970 expired in September and, pending renewal, the law is being kept alive by a continuing resolution. Hearings are under way in both the House and Senate, but there is little prospect of new legislation before next year. The Brookings paper is clearly intended to spur Congress to try some innovative rewriting of the law. Lave and Omenn say that it would be a great disservice for Congress to perpetuate the arbitrary rules now in effect. "Minor polishing of rough edges will not be sufficient," they write. And they propose five general guidelines for reform.

- First, Lave and Omenn say that the

* L. B. Lave and G. S. Omenn, "Cleaning the air: reforming the clean air act" (Brookings Institution, Washington, D.C., 1981).

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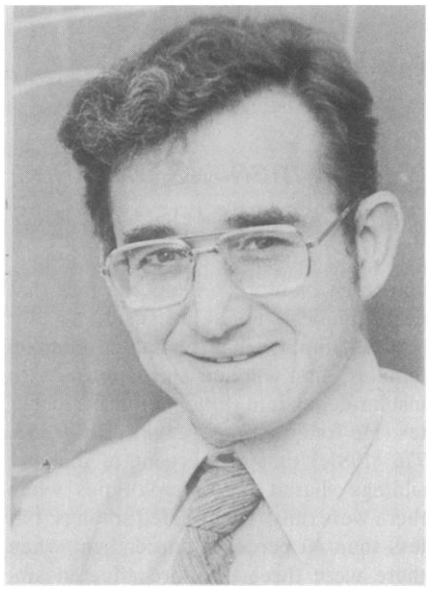


Paul Conklin

Lester Lave

How to discourage pollution?

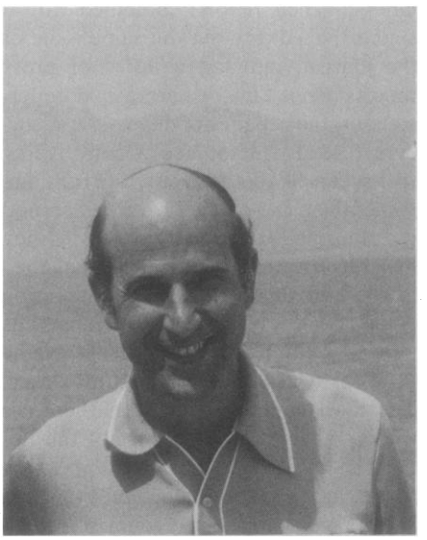
present regulations focus too much on new sources of pollution and too little on existing problems. For example, most factories are poorly monitored, and little is done to monitor automobile emissions once the cars have left the sales lot. "Congress should decide what kinds of control or incentives should be applied to the thousands of existing sources," and wherever possible, economic incentives rather than legal sanctions should be used to discourage pollution. Lave and Omenn favor having the government issue marketable discharge licenses, for example, which would permit the holder to release a certain fixed amount of contraband material into the atmosphere each year. The authors also argue that states should be more aggressive in controlling pollution from aging automobiles.

- Lave and Omenn find that the authority for controlling pollution is badly confused. They suggest that the federal government should monitor air quality, set public health standards, and determine policies for long-distance transport, national parks, and wilderness areas. States should have the primary authority for developing plans to meet federal standards, "subject only to EPA disapproval within a specified time period." And, of course, states would be responsible for enforcing their plans.
- Congress should try to clarify the purposes of the air quality standards. Lave and Omenn say that the present system is arbitrary in that it assigns great importance to seven "criteria" pollutants such as ozone and hydrocarbons, but many other pollutants, potentially more dangerous, are ignored. "General guidance is needed on what constitutes an adverse health effect, how margins of safety should be determined, how quality priorities are to be set, and how monitoring is to link community air quality with emission control requirements." Furthermore, the authors say, the government should try to take account of the cost of maintaining certain health standards at the time that the standard is being defined. In a discussion of the ozone standard, for example, Lave and Omenn suggest that the EPA has gone too far in protecting the most sensitive 0.05 percent of the general population. (These are the most sensitive 1 percent of the fraction of the general population that suffers from asthma, emphysema, and chronic bronchitis.) It would make more sense, according to Lave and Omenn, to worry about the level of pollution "that produces adverse health effects in half the sensitive population or even in the general population." Needless to say, shifting the focus in this manner would be controversial, because it could be taken as a sign that the government was becoming indifferent to people with lung difficulties.
- The authors find the Clean Air Act "too detailed in some sections and too vague in others." They would prefer a more coherent law that leaves the details of regulation to the bureaucracy and gets Congress out of its self-appointed role as designer and enforcer of automobile pollution controls.
- Congress should try to be more aware of the impacts of environmental protection laws on energy production and the economy. Federal agencies and congressional staffs should be asked to anticipate conflicts between environmental and other national goals and bring them into the open for early resolution.

The Brookings paper reflects the general view that air quality regulations are arbitrary, but the analysis does not meet with general approval. David Hawkins, former assistant EPA administrator for air programs and now a staff member of the National Resources Defense Council, disputes the finding that most of the improvement in air quality was the result of good luck and fuel switching. He claims that the Brookings paper fails to take account of the successful efforts to reduce fine particle emissions from steel and metal smelting plants.

Hawkins faults the analysis for relying on national average figures of air quality rather than on data from specific problem areas. "What happened in the 1970's," according to Hawkins, "is that the dirty air got cleaner and the clean air got a little dirtier." It was not until the Clean Air Act was amended in 1977, he says, that the EPA had authority to prevent the deterioration of air quality in pristine areas. Thus he thinks it is unfair to judge the record of an entire decade by looking at data that include both pristine and industrial areas.

Like others in the environmental movement, Hawkins supports in principle the recommendations that air quality standards be made more comprehensive and that enforcement be made more evenhanded. But he does not agree that the cost of implementing a health standard should be taken into account when



Gilbert Omenn

Use economic incentives where possible.

the standard is designed. Costs should be considered later, he says, only when the government is trying to choose among alternative methods of achieving a standard. Although Hawkins finds some merit in the idea that economic incentives might be used to control pollution, he does not think the idea will ever supplant the present system of inspections and legal sanctions. Most incentive schemes require the government to issue licenses to polluters. Monitoring and enforcing the licenses would require a much larger bureaucracy, according to Hawkins.

The Administration, like Congress, has been preoccupied with matters other than clean air and has offered few specific proposals of its own. Some Congress watchers point out that as a result of the delay in producing new legislation, the debate on the Clean Air Act will begin to heat up just as the 1982 elections draw into sight. This circumstance, it is said, will not be conducive to the searching and innovative review of the law.

—ELIOT MARSHALL